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CALIBRATION OF A PEM DETECTOR MODULE WITH DEPTH OF INTERACTION MEASUREMENT

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We present an *in situ* calibration technique for the LBNL Positron Emission Mammography (PEM) detector module that is capable of measuring depth of interaction. The detector module consists of 64 LSO crystals coupled on one end to a single photomultiplier tube (PMT) and on the opposite end to a 64 pixel array of silicon photodiodes (PD). The PMT provides an accurate timing pulse, the PDs identify the crystal of interaction, the sum provides a total energy signal, and the Γ=PD/(PD+PMT) ratio determines the depth of interaction. We calibrate using the Lu-176 natural background radiation of the LSO crystals. We determine the relative gain (*K*) of the PMT and PD by minimizing the skewness of the Γ distribution. We determine the depth dependence (α) from the fwhm of the Γ distribution with optimal *K*, and confirm this α to Γ-width correlation by measuring α for crystals excited at a specified depth with side-incident gamma rays. We also evaluate the performance of calibrated detector modules, presenting energy and depth of interaction resolution results.

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